

ASK THE EXPERT *Ship Breaker* by Paolo Bacigalupi- Environmental Issues (article 1 of 2)

## Disaster Risk and Children Part I: Why Poverty-Stricken Populations Are Impacted Most

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Column Editor: John S. Murray

Ask the Expert provides research-based answers to practice questions submitted by JSPN readers.

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**Question:** As the world experiences more frequent and increasingly deadly natural disasters, why are children living in poverty-stricken populations impacted most?

**John S. Murray, PhD, RN, FAAN and Stephen Monteiro, MS, EMT-P respond:** Over the past few years, the world has experienced natural disasters of unprecedented proportion from Hurricane Katrina in the United States and the massive earthquake in Haiti, to the destructive tsunami in Asia and worst flooding in Pakistan in recorded history (see Figure 1). The incidence and devastation of disasters today is greater than just a few decades ago. World-wide variations in climate patterns along with increased population densities on coastal and river regions has resulted in a dramatic increase in disaster-related morbidity and mortality, especially among children (Murray, 2011; United Nations, 2009). The purpose of this first column in a two-part series is to explore why children living in poverty-stricken populations are impacted most.

### REASONS FOR THE GROWING NUMBER OF INTERNATIONAL DISASTERS

A multitude of factors such as normal, recurring climate change, global warming, and socioeconomic changes have been identified as contributing factors



**Figure 1** 2010 Worst Flooding in Pakistan Recorded History.

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to the growing number of disasters witnessed globally (Tekeli-Yesil, Dedeoğlu, Tanner, Braun-Fahrlander, & Obrist, 2010; United Nations, 2009). As global temperatures rise, inhabitants living along coastal areas of the world, in particular, are at increased risk for disaster because of rising ocean levels (Diaz, 2006; Environmental Protection Agency, 2010; Kuepper, 2008). Global warming, and the effects of greenhouse gas emissions, will increasingly continue to have an

effect on rainfall and drought, the incidence of tropical storms, tsunami activity, and earthquakes. The result will be rising rates of disease and injury, decrement to world food and water supplies, and mass migration of populations to different parts of the world (Diaz, 2006).

Expected climate change and global warming are not the only dynamics creating greater risk for disasters. Many parts of the world are experiencing unsustainable exploitations of ecosystems because of overpopulation. Over a span of 40 years (1960–2000), the world's population doubled from three to six billion (Kuepper, 2008). With growing populations comes the potential for ecological degradation. Common consequences include increasing air, water, and soil pollution, loss of vegetation from overuse of land for grazing of livestock, deforestation because wood is the least expensive fuel source, and dwindling and wearing away of soil and mineral resources (Kuepper, 2008; United Nations, 2009).

#### POVERTY, VULNERABILITY, CHILDREN, AND DISASTERS

Research evidence suggests that children living in poverty are at significantly greater risk for negative outcomes during and in the period following disasters (Chen et al., 2007; Fothergill & Peek, 2004; Murray, 2011; Tekeli-Yesil et al., 2010; Zahran, Peek, & Brody, 2008). Disaster risk is overwhelmingly concentrated in areas of the world that are less developed and have ineffective systems of government that are slow or without the needed resources to respond to catastrophes. Recent examples are the earthquakes that hit Haiti and Chile in 2010. While the natural disaster in Chile was 500 times more powerful than the one in Haiti, the destruction and loss of life in Port-au-Prince, Haiti, was 400 times greater (Allianz, 2009). Disaster experts note that the reason for this great variability in scale of devastation is man-made and not geological in nature (Allianz, 2009). Port-au-Prince is an overpopulated city where homes, schools, hospitals, and other buildings are in very poor condition (see Figure 2). Almost two thirds of buildings in the largest city of the nation of Haiti are unsafe because of age or poor construction. Additionally, infrastructure such as communications and transportation systems are also frail and vulnerable to widespread destruction during a disaster (Allianz, 2009).

Another example of disaster risk is the continent of Asia, which is frequently plagued by earthquakes, floods, and drought. Poverty-stricken inhabitants



**Figure 2** Hazardous Living Conditions in Haiti.

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oftentimes contribute to their own risk. Deforestation and overcultivation of land as a means of survival results in ecological changes that pose significant risk for flooding, landslides, and drought (Allianz, 2009; Tekeli-Yesil et al., 2010; United Nations, 2009). Industrialized countries of the world also have some degree of disaster risk. The 2009 earthquake in Italy best exemplifies this hazard. While Italy has comprehensive modern building codes, there are many older residences in rural regions constructed of rubble stone materials, making them more susceptible to damage during disasters (Allianz, 2009).

Faulty systems of government pose another significant risk in disasters. One notable U.S. example is Hurricane Katrina. While the natural disaster was a strong storm, the severe flooding that occurred was the result of imperfect flood defenses that were not maintained (Murray, 2011). An international example is the 2008 earthquake in the Sichuan province of China which killed more than 68,000 people (Allianz, 2009). Reports show that the government officials and builders failed to ensure that building codes were enforced.

Children have been identified as being especially vulnerable during disasters because of physiological, psychosocial, and cognitive differences compared with adults, therefore requiring special consideration by healthcare professionals and disaster planners (Bradenburg & Arneson, 2007; Murray, 2010). However, other researchers have noted that children's marginalized positions in society, especially in poor countries, places them at a disadvantage when

it comes to being prepared for and responding to disasters. This hindrance results in children suffering disproportionately when disasters strike (Zahran et al., 2008). Zahran and colleagues (2008) have explored several social and environmental factors that contribute to children being at increased risk for injury and death during and after disasters. Causes of greater hazard include living in undeveloped or poorer countries and communities, residing in or attending school or other activities in poorly constructed and substandard buildings, separation from family members and neighborhoods, as well as facing malnutrition and hunger (Zahran et al., 2008). While the state of the science related to understanding the specific factors that make children more vulnerable for injury and death during disasters is maturing, much more scholarly knowledge is critically needed to more precisely understand the relative susceptibility of children for various types of catastrophes (Murray, 2010, 2011; Zahran et al., 2008). In addition, understanding the role of pediatric healthcare professionals in mitigating disaster risk for children is critically needed and will be the focus of the second column in this series.

## CONCLUSION

Experts predict that disasters will increase in frequency and severity in the future because of global warming and cyclical climate changes. Given this forecast, there is much pediatric healthcare professionals can do to help the international community mitigate the associated risks. While research continues to uncover the relationship among children, poverty, and disasters, additional research is needed to effect a change in the number of lives lost and property damaged because of disasters.

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# Will Climate Change Destroy New York City?

Marc Lallanilla, Assistant Editor | June 19, 2013 10:29am ET



A striking image of Verrazano Bridge in Brooklyn as Hurricane Sandy approaches on Oct. 29, 2012. Credit: [Carlos Ayala](#)

The city of New York — America's largest metropolis and home to over 8 million people — will be ravaged by the effects of climate change within a few years.

That's the bleak scenario presented by a recent 430-page report developed by a blue-ribbon panel of academics, environmental planners and government officials.

Released this month, the report, nicknamed "SIRR" for Special Initiative for Rebuilding and Resiliency, presents an ambitious plan for managing the worst effects of global warming, which include flooding, rising temperatures and extreme storms. [[8 Ways Global Warming Is Already Changing the World](#)]

The potential disasters laid out by the plan, however, could easily overwhelm New York City: Searing heat waves, pounding rainstorms and vast acreages flooded by seawater are all expected for the city and the surrounding region.

And as dire as these situations are for New York City as a whole, the implications for the city's most vulnerable populations — the elderly, children, disabled people and those with special needs — are even more ominous.

## **Sandy: a harbinger of storms to come**

On Oct. 29, 2012, New York City and the surrounding area woke up to a reminder of nature's fury when Hurricane Sandy struck the region.

In addition to causing nearly \$20 billion in damage, the storm killed 43 people and injured many more. The city's transportation facilities, including airports, commuter trains, subways and highways, were effectively shut down. [On the Ground: Hurricane Sandy in Images]

Other critical infrastructure, such as hospitals and wastewater treatment plants, were incapacitated, and millions of city residents were thrown into darkness by the flooding of electrical facilities. Communication networks were similarly crippled as personal cellphones, computer screens and other devices went dead.

Experts are quick to point out that Hurricane Sandy cannot be directly blamed on climate change, but say that similar storms are more likely in the near future, based on existing trends.

"There has been an increase in the strength of hurricanes, and in the number of intense hurricanes, in the North Atlantic since the early 1980s," Cynthia Rosenzweig, a NASA researcher and co-chair of the New York City Panel on Climate Change (NPCC), said at a recent news briefing.

And Sandy's devastation was made worse by existing climate realities. "Sea level rise already occurring in the New York City area, in part related to climate change, increased the extent and magnitude of coastal flooding during the storm," according to a 2013 NPCC document.

## **New York's future laid bare**

After Sandy exposed New York's vulnerability to the impacts of climate change, Mayor Michael Bloomberg was emboldened to create the plan outlined in the recent SIRR report.

Among the report's many projections, written in a detached academic tone, are a number of genuinely frightening scenarios. A handful stand out as extreme events, said Rosenzweig, who refers to them as "the Big Three":

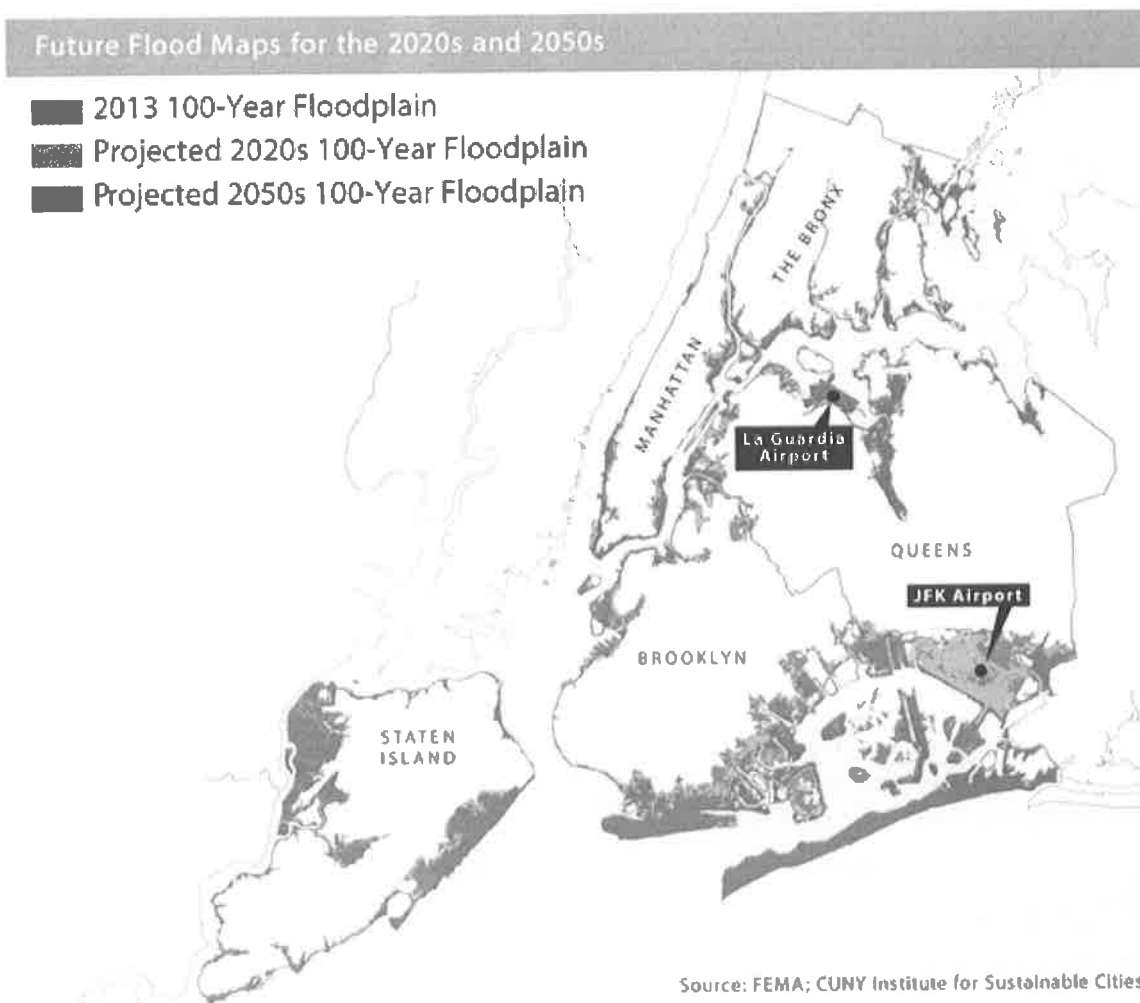
**Heat waves:** In decades past, New York experienced an average of 18 days a year with temperatures at or above 90 degrees Fahrenheit (32 degrees Celsius). But the city could experience 26 to 31 such days by 2020 — just seven years from now.

And by 2050, New Yorkers will swelter under as many as 57 days — almost two full months — of temperatures above 90 degrees F, the report projects. These heat waves "could cause ... about 110 to 260 additional heat-related deaths per year on average in New York City," the SIRR report states.

**Intense precipitation:** Instead of experiencing an average of two days per year with rainfall exceeding 2 inches (5 centimeters), New York City will endure up to five such days by 2020 — almost triple the current number.

**Coastal flooding:** By 2020, the chances of a 100-year flood (a flood with a 1 percent chance of occurring in any given year) at the Battery in downtown Manhattan will almost double, according to SIRR projections. By 2050, the chances will increase fivefold.

The heights of 100-year floods are also expected to increase, from 15 feet (4.6 meters) to as high as 17.6 feet (5.4 m) at the Battery. These effects will be experienced dramatically in swamped coastal neighborhoods and at important low-lying facilities such as John F. Kennedy International Airport and LaGuardia Airport.



*Pin it* This map of New York City shows the areas most impacted by climate change-related flooding.

Credit: FEMA, CUNY Institute for Sustainable Cities

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## **Populations at greatest risks**

During Hurricane Sandy, 26 nursing homes and adult-care facilities had to be closed, forcing the evacuation of about 4,500 people. And six hospitals, including four in Manhattan, were also closed and almost 2,000 patients evacuated.

These evacuees represent just a small fraction of New York City's most vulnerable populations, who are at greatest risk from the projected impacts of climate change-related disasters, said Dr. Irwin Redlener, director of the National Center for Disaster Preparedness in New York City.

"I don't think people realize that vulnerable people — who may be vulnerable for a variety of reasons, whether they're very young or very old or sick or disabled — are roughly 40 to 50 percent of the population," Redlener told LiveScience.

"The success of disaster planning and response could be gauged by how well we handle those vulnerable populations," Redlener said. "This is a big problem, because most of our official planning organizations tend to do very generic planning."

Hurricane Sandy presented a number of case studies in disaster planning successes and failures. After Coney Island Hospital in Brooklyn lost power, backup generators supplied electricity until the generator room flooded and all power was lost.

During the height of the storm, "the staff valiantly cared for patients using flashlights and battery-powered medical equipment," the SIRR report states.

By contrast, the nearby Shoreham Center for Rehabilitation and Nursing Care was built in 1994 to withstand a 500-year flood (a flood with a 0.2 percent chance of happening in any given year). Its suite of backup generators supplied power for four days during an area-wide blackout, and the facility was able to provide food and shelter to many of Brooklyn's stranded residents.

Unfortunately, the example of Coney Island Hospital — which was forced to send more than 200 patients to other facilities — may be more typical of the way vulnerable populations experience climate change-related disasters.

"I visited shelters for families in the aftermath of Sandy, and they didn't have baby food, they didn't have diapers and they didn't have cribs," Redlener said. "This is typical of what happens when you do generic planning — you end up leaving lots and lots of people out."

## **Cities: ground-zero for climate change impacts**

New York's SIRR plan calls for about \$20 billion in infrastructure improvements, including strengthening utility and transportation networks, renovating buildings and constructing seawalls and shoreline buffers, including a massive residential and commercial development named "Seaport City."

Though it's ambitious, New York's planning isn't atypical for coastal cities, which have assumed a leadership position in addressing climate-change risks since they will likely bear the brunt of its expected impacts.

Through the Urban Climate Change Research Network (UCCRN), cities are sharing scientific and economic research to support and inform decision makers in those areas, Rosenzweig said.

"We work with cities all over the world. New York is definitely one of — if not the — leader, but there are other U.S. cities that also have a longer-term history of addressing [climate change]," Rosenzweig said.

"Prime examples are Seattle, Chicago, Los Angeles, San Francisco and Miami, of course, because of their risks," Rosenzweig said.

"It's really striking that cities are emerging as the first-responders to climate change," Rosenzweig said. "It's a very exciting and very positive story — the cities are really stepping up."

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